How much do agreements matter for services trade?

ANIRUDH Shingal

University of Sussex, Department of Economics, World Trade Institute

17. June 2009

How much do agreements matter for services trade?

Anirudh Shingal[1]

May 2010

Abstract

With an increasing number of Preferential Trade Agreements (PTAs) covering trade in services, we explore the impact of PTAs on services trade. To the best of our knowledge, this is the first paper in this literature that endogenizes the impact of preferentialism in estimating the trade effect. We also add to this literature by distilling the trade effect of PTAs into that emanating from services and "goods only" agreements and further confirm complementarities between the two. Moreover, we study these relationships disaggregated by the economic status of the partner countries and by the reciprocity of commitments. Our results suggest trade effects of 11.6 – 12.7% from having a services accord alone. They also reveal that the underlying services trade between countries has been driven as much by IRS as by factor differences and that asymmetric trade alliance between North-South partners has been successful in fostering inter-industry trade.

Key words: Services trade, RTAs, gravity model, endogeneity, North-South

JEL Classification: F10, F13, F15

[1] Senior Research Fellow, WTI, University of Bern & Research Affiliate, CARIS, University of Sussex. I would like to thank Alan Winters, Peter Holmes, Mike Barrow, Simon Evenett, Michael Gasiorek and Pierre Sauve for their constructive comments and suggestions at various stages. This paper was presented at the Twelfth Annual Conference of the European Trade Study Group at the University of Lausanne and at the WTO Public Forum in Geneva in September 2010. An earlier version was also presented at a CEPR Meeting on Globalization, Investment and Services Trade at the University of Milan in June 2009. The usual disclaimer applies. Address for correspondence: World Trade Institute, Hallerstrasse 6, CH - 3012, Bern; Email: anirudh.shingal@wti.org.

Table of Contents

List of figures and tables

List of annex tables

1. Introduction

Of the 55 Preferential Trade Agreements (PTAs) notified to the WTO in the period before 2000, 49 were goods agreements. In the years since 2000 on the other hand, 150 PTAs have been notified which include 76 goods agreements, 4 services only accords and another 70 covering both goods and services. Clearly then, more and more trading partners are negotiating services provisions in PTAs which suggests both the growing importance of services trade in general and the need to institutionalize such trade between countries. The obvious question then is how effective have these agreements been in fostering services trade.

Economic literature is replete with theoretical models and empirical analyses documenting the impact of PTAs on trade between partner countries. Most of this work, however, has looked at trade in merchandise goods only. An important reason for this has been the lack of availability of bilateral services trade data. This lacuna has, however, been filled with the publication of the OECD's database on bilateral services trade[2]; since its publication Grünfeld & Moxnes (2003), Kimura (2003), Kimura & Lee (2004, 2006), Lejour & Verheijden (2004), Mirza and Nicoletti (2004), Kox & Lejour (2005), Lennon (2006) and Walsh (2006) have used this dataset to assess determinants of bilateral services trade using the gravity framework.

However, there is a general lack of consensus and conformity to economic theory in these authors' key findings. Grunfeld & Moxnes (2003), for instance, find the impact of PTAs to be insignificant. Kimura & Lee (2004) find distance to be more important for services trade while Lejour & Verheijden (2004) and Lennon (2006) report the converse to be true. Walsh (2006), on the other hand, finds the impact of distance to be insignificant. Similarly, Kimura & Lee (2004) find the impact of common language to be insignificant, which is refuted by Lennon (2006) and Walsh (2006).

In this paper, we base the gravity model on an intuitive understanding of the determinants of bilateral services trade by sector and mode of delivery and thereby generate results that are

[2] In 2002, the OECD Secretariat presented data on total trade in services, broken down by partner country, for 26 OECD member countries over 1999-2002.

better validated by economic theory. We add to the literature in this area by distilling the trade effects of PTAs into those emanating from services and "goods only" agreements and further confirm complementarities between the two. We also study the impact of bilateral trade in goods on bilateral services trade more directly than has hitherto been explored in the empirical literature. Our analysis also explores the PTA-services trade relationship disaggregated by the economic status of the partner countries and by the reciprocity (or lack thereof) of commitments. To the best of our knowledge, this is also the first paper in the literature on gravity model estimation of services trade that endogenizes the impact of preferentialism in estimating the trade effect using advanced estimation techniques.

On the whole, our results suggest a trade effect of 11.6% from having a services accord alone. This effect rises to 12.7% for the non-EU trading partners in our sample. The incremental impact of a "goods only" PTA in addition to a services PTA is found to be 2.4% (2.3%) for all (non-EU) trading partners, but this result lacks statistical significance. We also find both North-North and North-South services agreements to generate positive trade effects which suggests that the associated pattern of trade is both intra- and inter-industry. Moreover, within North-South agreements and irrespective of the type of the agreement, asymmetric accords always have the larger trade effect and this is always positive.

The rest of the paper is structured as follows. In the next section, we look at the determinants of services trade by sector and mode of delivery based on their classification in the GATS to zero-in on the common set of factors that may have a bearing on bilateral services trade. Section 3 introduces the empirical model used in this paper while Section 4 looks at the dummy variables used in the analysis to capture the trade effects of different types and forms of PTAs. Section 5 describes the data and conducts a preliminary examination of it while Section 6 looks at recent developments in the literature on gravity model estimation and methodological issues. The next two sections discuss the basic results from the empirical model as well as the results disaggregated by type of agreement and nature of relationship. Section 9 concludes.

2. Determinants of bilateral services trade

To begin with, we consider the set of major services sub-sectors (listed in the Central Products Classification of the GATS) for trade between any two possible trading partners and for each of them, suggest possible modes of services delivery[3] and the most important likely determinants of such trade, based on our intuitive understanding of the latter. This is reported in Table 1. The purpose of this exercise is to zero-in on the common set of factors that may affect trade in services between partners and to use them in a gravity model for services. Thus, if we look at Table 1 for computer and related services, we see that these are delivered cross-border, through commercial presence and the movement of professionals (Modes 1, 3 and 4, respectively) and the likely determinants of such trade between partners include infrastructure and human capital resources as well as the presence of a common business language and an open policy regime.

<Insert Table 1 here>

Replicating this analysis for the other sub-sectors listed in Table 1, we find that the common set of factors that emerges as important determinants of services trade is market size (economic), trade in goods, the presence of an English speaking work-force, quality infrastructure, open policy regime (i.e. few restrictions on the various modes of services delivery), low cost human capital and common laws/legal systems. These are the variables that we use in a gravity model as determinants of bilateral services trade. In addition, we use geographical distance to proxy the costs involved in transportation between countries and to estimate the trade effect of a services agreement, we include a PTA dummy that takes the value 1 for countries that are members of a PTA that has an element of services liberalization in it.

[3] The WTO's General Agreement on Trade in Services (GATS) classifies four "modes" of services delivery (these are the different ways in which services can be traded across borders): **Mode One,** which is the cross-border supply of services. An illustration of this is business process outsourcing units in India doing online medical transcriptions. **Mode Two** is consumption of services abroad for e.g. Indian tourists going to the EU. **Mode Three** is commercial presence, such as Deutsche Bank setting up operations in Mumbai. Finally, **Mode Four** is the movement of natural persons across borders to deliver services. An illustration of this is Indian software professionals working on-site on IT projects in the UK.

3. The empirical model

Using the determinants identified above, we estimate our model in a log-linerarized form, setting bilateral services trade data in a panel, available from the OECD's database for 25 exporting and 53 importing countries for five years over 1999-2003.

$$\mathbf{svsx_{ijt} = \alpha_{ij} + \beta_1 gdp_{it} + \beta_2 gdp_{jt} + \beta_3 pcgdp_{it} + \beta_4 pcgdp_{jt} + \beta_5 dist_{ij} + \beta_6 gdsx_{ijt} + \beta_7 ENG_{ij} + \beta_8 teleden_{it} + \beta_9 teleden_{jt} + \beta_{10} rest_i + \beta_{11} rest_j + \beta_{12} hk_{it} + \beta_{13} hk_{jt} + \beta_{14} LAW_{ij} + \beta_{15} PTA\_SVS_{ijt} + \varepsilon_{ijt} \ldots\ldots\ldots\ldots\ldots\ldots (1)}$$

All variables in lower case are in log levels; the sub-script 'i' refers to the exporter, 'j' to the importer, 't' is the sub-script on variables that vary over time. All continuous variables are in log form with the exception of the dummy variables. The variables, their description and data sources are reported in Table 2.

<Insert Table 2 here>

A priori, we expect the estimates of β_1, β_2, β_5 through β_8, and β_{11} through β_{14} to be positive and those of β_3, β_4, β_9 and β_{10} to be negative.

4. More about the PTA dummies

The crucial explanatory variable in our model from the perspective of this paper is the dummy on participation in PTAs involving elements of services liberalization. We refer to notifications made to the WTO Committee on RTAs for country-specific information in this regard. The estimated coefficient on the PTA_SVS dummy provides the direction and magnitude of the impact of a services agreement on the bilateral services trade between the trading partners in our sample[4].

[4] A lacuna in this analysis, however, is the homogeneity of the PTA_SVS dummy i.e. the use of the same dummy for all trading pairs in our sample. Ideally, the PTA dummies should be calibrated according to the extent of liberalization achieved/expected to be attained in each of the agreements, which would then yield more precise estimates of the trade effects.

At the outset it is important to note that for the period of our analysis (1999-2003), 22.3% of the observations in our sample have a services accord (PTA_SVS), while 27.8% of them have a goods agreement (PTA_GDS). All trading partners that have a services agreement also have a goods agreement. Thus, the impact of a services accord also carries with it the impact of goods agreements and in that, the two cannot be separated from each other. This also implies however, that about 5.5% of our observations have a "goods only" agreement (GOPTA) and we can thus study the independent and joint impacts of having a "goods only" agreement and the "pseudo-incremental" impact of having a services agreement.

We also classify agreements (both services and any) as North-North (NN), South-South (SS) and North-South (NS) depending on the economic status of the partner countries[5]. Following Gasiorek et al (2007), we also break down NS accords into symmetric and asymmetric depending on the extent of reciprocity of commitments and their implementation between the partner countries[6]. Interestingly, we found our sample of symmetric pairings to be influenced by former Central and Eastern European Countries[7] (CEEC) that were signing and implementing Association Agreements with the EU. It is therefore possible that services trade flows towards the CEEC may have also been influenced by other factors such as the likelihood of future accession to the EU. Our analysis, therefore, also includes a division of the North-South symmetric dummy into two parts, one, which looks at flows from the North to the South countries such as Israel and South Africa and two, which covers flows from the EU to CEEC to control for the impact of trade agreements between the EU and CEEC, especially if, as expected, trade flows to the latter have been affected more by non-trade-related reasons.

We thus have:

- the South-South PTA dummy that takes value one if the two countries are both developing and in the same preferential agreement, zero otherwise;

[5] We do this according to the definitions of the WTO such that while Mexico is an OECD country for instance, we classify it as a South country. All EU-15 Members are classified as "North" countries, while the new EU Members are classified as "South" countries as they had not acceded to the EU for the sample period (1999-2003) in our analysis.

[6] USA-Singapore would be a symmetric NS PTA while USA-Chile would be an example of an asymmetric NS PTA.

[7] These included Bulgaria, the Czech Republic, Hungary, Slovakia and Poland in our sample, all of which have now acceded to the EU.

- the symmetric North-South PTA dummy that takes value one if one country partner is developed, the other is developing and both countries are in the same agreement characterised by a perfectly reciprocal implementation, zero otherwise;
- the EUCEEC dummy that takes value one if one partner country is from EU-15 and the other is one of the CEEC;
- the asymmetric North-South PTA dummy that takes value one if one country partner is developed, the other is developing and both countries are in the same agreement characterised by a less than reciprocal implementation, zero otherwise;
- the North-North PTA dummy that takes value one if the two countries are both developed and in the same preferential agreement, zero otherwise.

Since our data covers the period 1999-2003, if an agreement was reached before 1999, the associated dummy variable takes a value 1 over 1999-2003. On the other hand, if the agreement came into effect after 1999, then the dummy takes a value 1 in the year of accession and every year after that and a value 0 otherwise[8].

5. Data description and preliminary analysis

There are more than 6600 observations on the variables in our model for the 25 exporting and 53 importing countries in our sample (the list of these countries is included in Annex Table A1). Preliminary diagnosis of the data revealed that four trading partners had reported negative services exports[9]. These observations were excluded from the sample. In addition, data on services exports was found missing for over 2000 observations over 1999-2003, which effectively reduces the sample size by that number. Table 3 shows the mean value for our sample variables, along with the minimum, maximum and the standard deviation. Wherever required, the nominal values have been converted to real terms, using the US GDP implicit price deflator.

[8] This treatment also renders our PTA dummies time-variant, which, from the perspective of empirical analysis, means that they can be retrieved in fixed-effects specifications.
[9] These were: France-Norway, France-Philippines, Ireland-Brazil & Czech Republic-Colombia.

<Insert Table 3 here>

Figure 1 shows trading partner pairs in our sample which had bilateral services exports in excess of USD 10 bn over 1999-2003. Looking at these cross-section averages over 1999-2003, we find that 17 trading pairs (1.7% of the entire sample) had bilateral services exports in excess of USD 10 bn and interestingly, half of these had a services agreement with each other.

<Insert Figure 1 here>

The data has also been tabulated by percentile distribution of bilateral services exports averaged over 1999-2003 and the existence of PTAs (see Table 4). About 17% of all trading pairs in the sample had a value exceeding USD 1 bn (and more than half of these had a services accord with each other), which points towards a highly skewed distribution (bilateral services exports of the 90th percentile is 526 times that of the 10th percentile in Table 4). Also, as expected, both larger bilateral goods and services exports are associated with a PTA or a services PTA between trading partners. Bilateral services exports are 2.3 (2.0) times higher and bilateral goods exports 3.7 (3.1) times higher in the presence of a services (any) PTA than otherwise (see Table 4)[10].

<Insert Table 4 here>

Bivariate relationships between bilateral services exports and each of the independent variables are evident from Table 5 on cross-correlation (column 2) and suggest that these relationships validate the empirical model that we use. Table 5 also shows that the data suffers from multicollinearity; per capita income in particular was found to be strongly correlated with human capital, teledensity and the restrictiveness measures (correlation coefficient exceeding absolute 0.45 in each case). We addressed this problem by using the difference in the levels of PCGDP as an explanatory variable instead of the log levels, which also served to test Linder's Hypothesis[11]. The correlation between goods exports and GDP is addressed in an appendix to

[10] These magnitudes do not account for factors other than the existence of a trade agreement that have a bearing on bilateral services trade and are therefore larger than the trade effects from our multivariate analysis in the following section.

[11] This states that countries at similar levels of PCY trade more intensively with each other.

this paper as it discusses the treatment of bilateral goods trade as an explanatory variable in our model. The other variables found to be correlated included GDP and human capital of the exporting country; teledensity and restrictiveness in the exporting country; teledensity and human capital in the importing country; goods and services PTA dummies; and PTA dummies and distance.

<Insert Table 5 here>

The first set of regressions was carried out using OLS on the complete model with all the explanatory variables. It was found that GDP_{kt}, $PCGDP_{kt}$, $GDSX_{ijt}$, $TELEDEN_{it}$, $REST_j$, $DIST_{ij}$ and the dummies for ENG_{ij}, RTA_{ij} and PTA_SVS were all statistically significant and of the "right" sign. The coefficient on HK_{kt} was negative and statistically significant, which was due to its correlation with GDP_{kt}. One way to address this problem was to regress GDP_{kt} on HK_{kt} in separate estimations for the exporting and importing countries and use the residuals from the respective equations *in lieu* of HK_{kt}, which is what we did. The counter-intuitive estimates of $TELEDEN_{jt}$ and $REST_i$ were due to multicollinearity as well; this was addressed by excluding these variables one by one from the complete model. The coefficient for LAW_{ijt}, however, was found to be negative and statistically significant throughout specifications, which was a perverse result. It was thus decided to leave this variable out of the estimation.

The final specification was as follows:

$$\mathbf{svsx_{ijt} = \alpha_{ij} + \beta_1 gdp_{it} + \beta_2 gdp_{jt} + \beta_3 DPCGDP^{12}{}_{ijt} + \beta_4 dist_{ij} + \beta_5 gdsx_{ijt} + \beta_6 ENG_{ij} + \beta_7 teleden_{it} + \beta_8 teleden_{jt} + \beta_9 rest_i + \beta_{10} rest_j + \beta_{11} hk_{it} + \beta_{12} hk_{jt} + \beta_{13} PTA\_SVS_{ijt} + \varepsilon_{ijt}} \quad \textbf{.................................(2)}$$

Initial empirical diagnosis also showed Luxembourg and the Slovak Republic to be outliers amongst our services exporters and Iceland, Nigeria & Pakistan to be outliers amongst our list of importers. We found that the outliers biased the estimates of the coefficients on some of our explanatory variables (such as goods exports, exporter GDP, importer human capital, importer

[12] Since the difference in PCY can be negative, if we used the log of this difference, we would lose observations; hence, we use the level of the difference. Statistically, we can still derive the elasticity by multiplying the mean of the difference in PCY by the coefficient on this variable.

teledensity, common language and services PTA[13]) upwards and others (such as importer GDP, restrictiveness and distance[14]) downwards. However, in view of the fact that the magnitude of the bias on the variable of our interest, the estimated trade effect, was only 1.2 percentage points[15], while the exclusion of the outliers from the sample decreased the potential size of the sample by 19%, we decided to continue with the entire sample in our empirical investigations.

6. Recent developments in the literature on gravity model estimation and methodological issues

The choice of the empirical strategy is governed by the underlying theory, data and its characteristics, recent developments in estimation methodology and any other objective(s) that the researcher may have. In our case, the main econometric problems were to correct for biases emanating from (i) the unobserved heterogeneity characterizing trading partner samples; (ii) the incidence of "export zeroes[16]"; and (iii) treating the PTA explanatory variable(s) as exogenous. Given that less than 5% of our dependent variable observations reported "zero" exports, we focussed on addressing problems (i) and (iii) and decided on the Hausman-Taylor Method (HTM) to cater to these problems, using instrumental variables from the data itself. Using the Hausman over-identification test, we identified some of our independent variables as endogenous (these included GDP, human capital, teledensity, restrictiveness and the PTA dummies) and others as exogenous (distance and common language in our specification) and used the mean of the exogenous independent variables as instruments for the time-variant or endogenous independent variables correlated with (specific) bilateral effects to account for the unobservables, *a la* Hausman & Taylor (1981). We also found our data to be heteroskedastic, on account of which there would be problems with efficiency and consistency, but this would

[13] Evenett (2002) came up with an identical direction of the bias in his analysis of the estimated trade effect (but an opposite direction in the case of distance). "My econometric findings suggest that the presence of outliers tends to substantially increase the absolute value of the estimated distance parameter and the estimated dummy variable." (Evenett, 2002, op.cit.,pp 558)

[14] i.e the absolute values of the estimated restrictiveness and distance parameters increased in the absence of outliers.

[15] The estimated coefficient went up from 0.11 to 0.12.

[16] For instance see Helpman et. al. (2008), Baldwin & Harrigan (2008) and Ben Shepherd (2008).

not bias the estimates[17]. In this section, we provide more details on the methodological issues that governed the final choice of estimation technique for our empirical model and also discuss robustness checks based on recent developments in the literature on gravity model estimation.

The earliest applications of the gravity equation to international trade flows were not grounded in formal theory. It was only with Anderson (1979) that formal theoretical economic foundations to the gravity model surfaced. One of the salient features of the latter has been the inclusion of multilateral price measures in estimating the gravity model, which *ipso facto* takes care of the omitted variable bias that existed in the earlier models owing to the absence of such variables[18]. Following Anderson & van Wincoop (2003) and Feenstra (2004) this has been achieved in the literature by including country-specific effects in the model, which is a computationally easier route for the inclusion of multilateral price measures. Cheng & Wall (2004) further showed that the best estimates came from estimating a pair-wise bilateral fixed effects model, while Baier & Bergstrand (2007) have recently added country-and-time effects to the pair-wise bilateral fixed effects model, wherein the former account explicitly for the time-varying multilateral price terms in a panel setting. This is also one of the methodologies that we empirically tested in this paper.

The other recent change in gravity model estimation has been scaling the dependent variable by the product of the real GDPs of the trading partners (i.e. svsx/gdpi.gdpj), which amounts to imposing unitary income elastic restrictions on the gravity model. However, as Baier & Bergstrand (2007) show, this has no impact on the coefficient of the PTA dummy if the model is estimated with country-and-time effects. This was also confirmed by our own tests; we further found that the explanatory power was significantly reduced in this specification. For both these reasons, we did not impose any unitary income elastic restrictions on our empirical specification.

[17] In any case, we use robust or White's Heteroscedasticity-consistent standard errors (HCSE) estimates wherever required.

[18] It is now fairly well established in gravity model literature that a simple OLS estimation tends to bias the results as there are likely to be effects common to the trading countries that are not included in the estimation (Cheng & Wall, 2004). In other words, heterogeneity is not allowed for. These effects could be due to "historical, cultural, ethnic, political, or geographic factors that affect the level of trade and correlated with the gravity variables (GDP, population, distance)." (Cheng & Wall, op.cit. pp 54)

Finally, in a significant departure from earlier work, researchers (Magee, 2003; Baier & Bergstrand, 2002, 2004, 2007; Egger et.al. 2008) have begun to treat the PTA dummy as an endogenous (as opposed to hitherto exogenous) independent variable. While we document the results from both approaches in this paper, our results focus on the treatment of the PTA dummy as an endogenous variable.

We began our estimation of the gravity model with the PTA dummy as an exogenous variable and in that, report results from four different techniques by way of comparison: ordinary least squares (OLS), pair-wise fixed-effects (FEM), Hausman-Taylor (HTM) & Poisson Pseudo-Maximum Likelihood (PPML) [see Table 6].

Both FEM and HTM, as opposed to OLS, account for the heterogeneity in the data stemming from the unobservables common to the trading partner pairs and in that are superior to OLS, which *ipso facto* suffers from an omitted variable bias. Both Egger (2002, 2005) and Carrere (2006, pp 231-232) advocate the use of HTM over FEM in cross-section and panel settings, respectively. The HTM also has the added advantage of retrieving the coefficients of time-invariant variables like distance and common language in the results, which is not possible using FEM, which also consumes too many degrees of freedom. Moreover, unlike FEM, HTM also empirically enables the treatment of the FTA dummy as an endogenous (as opposed to exogenous) variable in estimating the trade effect of an accord.

PPML, on the other hand, neither accounts for the unobserved heterogeneity in the data nor enables endogenous treatment of the PTA dummy. Rather, it advocates the use of a simple Poisson Pseudo-Maximum Likelihood because in the presence of heteroskedasticity in the data, the standard log-linearized gravity model yields inconsistent estimates[19] (Silva & Tenreyro, 2006; Siliverstovs & Schumacher, 2007). "An additional problem of log-linearization is that it is incompatible with the existence of zeroes in trade data, which led to several unsatisfactory solutions, including truncation of the sample and further non-linear transformations of the dependent variable." (Silva & Tenreyro, op.cit., pp 653) The PPML, therefore, corrects for all

[19] "This is because the expected value of the logarithm of a random variable depends on higher-order moments of its distribution. Therefore, if the errors are heteroskedastic, the transformed errors will be generally correlated with the covariates." (Silva & Tenreyro, op.cit., pp 653)

these problems. However, these problems were found not to be as important for our data as the biases emanating from unobserved heterogeneity and the exogenous treatment of the PTA dummy, for which reason, the HTM, with the PTA dummy treated as an endogenous variable, is our preferred estimation.

The recent acknowledgement of endogeneity of the PTA dummy in the empirical trade literature is based on the intuition that if there is a tendency for countries to "self-select[20]" themselves into an accord, then treating the PTA dummy as exogenous would under-estimate the magnitude of the trade effect[21]. The treatment of endogeneity in cross-section data has been done through the use of instrumental variables and Heckman control functions (Magee, 2003; Baier & Bergstrand, 2002, 2004, 2007) but this has been said to be unsatisfactory (for e.g. see Baier & Bergstrand, 2007) largely on account of the choice of instruments and the instruments not being exogenous of the error term. On the other hand, Baier & Bergstrand (2007a, 2007b) have claimed that the use of a bilateral pair-wise fixed effects model with country-and-time effects or alternatively, the use of OLS in a difference-in-difference model, both using panel data, lead to a more satisfactory treatment of the endogeneity problem. *A la* Baier & Bergstrand (2002, 2007), we thus also estimated a bilateral pair-wise fixed effects model (FEM) with country-and-time effects as well as a difference-in-difference (DID) model to endogenize the effects of the PTA dummy in our panel. To the best of our knowledge, this is the first attempt in the literature on gravity model estimation of bilateral services trade to endogenize the trade effect.

However, Baeir & Bergstrand (2002, 2007) used a panel of cross-section time series data at five-year intervals from 1960 to 2000, which meant that they had a lot more degrees of freedom to contend with in their bilateral pair-wise fixed effects model (FEM) with country-and-time effects and difference-in-difference (DID) models than would be possible with our sample. Moreover, given that our data covers a much shorter time horizon, it is conceivable that several of our country-and-time effects would be collinear with the PTA dummies and hence, drop out

[20] i.e. countries that enter into an agreement are already those that trade significantly with each other and vice versa.

[21] For instance, Baier & Bergstrand (2007) find the trade effect from goods agreements to quintuple once the PTA variable's endogeneity is accounted for econometrically.

of the estimation. For both these reasons, we focus on the results from the HTM for the analysis in this paper. *We do however provide results from the two Baeir & Bergstrand (2002, 2007) estimations as well in Table 6 and find these techniques to generate positive, albeit statistically insignificant, trade effects.*

Other recent changes in gravity model estimation have involved decomposing the total trade effect of a PTA into the Vinerian effects of trade creation and trade diversion (e.g. see Frankel, 1997; Soloaga & Winters, 2001; Silva & Tenreyro, 2006; Carrere, 2007) and accounting for the phasing-in effects of PTAs (e.g. see Baier & Bergstrand, 2007).

The former essentially involves introducing a new dummy variable in the equation (say OPENNESS) that takes the value 1 when any or both trading partners have a trade agreement with the rest of the world (ROW). The net trade creation effect of a PTA is then the difference between the estimated coefficients on the PTA and the OPENNESS dummies[22]. In our sample, all trading partners have some form of an agreement with ROW such that the OPENNESS variable takes the value 1 throughout and hence, is dropped out of our estimation due to collinearity. We therefore estimate our model without this dummy. Our PTA dummies therefore denote the *gross*, as opposed to the *net*, trade creation effect of an agreement.

Baier & Bergstrand (2007) accounted for the phasing-in of PTAs by introducing the lagged effects of PTA on trade. Given that every PTA has a phase-in period, typically over 10 years[23], the entire treatment effect on trade cannot be captured in the concurrent year. They therefore use one or two lagged levels of the PTA dummy in their estimation ($PTA_{ij,t-1}$ and $PTA_{ij,t-2}$), which accentuates the average treatment effect. They use a panel of cross-section time series data at five-year intervals from 1960 to 2000, which can enable the study of the lagged effects of PTA on trade.

[22] Logically, the functioning of these dummies is relative to none of the countries in the sample having any agreement with ROW.
[23] For instance, both the original EEC agreement of 1958 and the NAFTA had a 10-year phase-in provision.

In our case, however, since the data ranges from 1999 to 2003 only, we do not have enough of a time horizon to capture the impact of such anticipation effects[24].

7. Results from multivariate analysis

For purposes of comparison, we provide the results from using different estimation techniques in Table 6. However, for the reasons outlined in the preceding section, we focus on the results from HTM, both for this section and for the remainder of the analysis in this paper.

<Insert Table 6 here>

As expected, GDP of the partners showed up as positive and statistically significant. The associated elasticities were 0.58 for the exporter and 0.49 for the importer **(see Column HTM of Table 6)**. Thus, a 10% rise in the GDP of the exporter would, *ceteris paribus and on average*, lead to a 5.8% rise in bilateral services exports and a 10% rise in the importer's GDP would raise bilateral services exports by 4.9%, *ceteris paribus and on average*[25]. Thus, in line with literature in this area (Grunfeld et al (2003)), there is a clear home market effect in service trade with the GDP of the exporting country having a stronger impact on the export of services than the GDP of the importing country. This also follows Feenstra, Markusen and Rose (2001) and is consistent with the idea that services are of a highly heterogeneous nature.

Goods exports have an estimated coefficient of 0.17 in the HTM specification, thereby suggesting that a 10% rise in bilateral goods exports would, *ceteris paribus and on average*, lead to a 1.7% rise in bilateral services exports in this model.

[24] In fact, our attempts at doing so resulted in the theoretically counter-intuitive outcome that suggested positive trade effects of anticipation and negative trade affects of actual accession itself!

[25] These estimates are lower than those from the literature in this area as well as those from the other estimation methods documented in Table 6, primarily because of our use of the HTM which corrects for biases emanating from unobserved heterogeneity and exogenous treatment of the PTA dummy.

The coefficient on the difference in PCGDP between the exporting and importing countries was found to be negative, which therefore confirmed Linder's hypothesis, but this result was statistically insignificant.

Human capital in the exporting country had an elasticity of 0.89, which suggests its importance as a determinant of bilateral services exports. The coefficient on human capital in the importing country, on the other hand, was small and insignificant (elasticity of 0.089).

As expected, both the teledensity variables had a positive impact on bilateral services but the elasticity was statistically insignificant for the exporter due to collinearity with the restrictiveness variable.

Our restrictiveness measures of services trade showed large symmetric negative effects on bilateral services export with elasticities of -1.7 and -1.4 for the exporter and importer, respectively, but these lacked any statistical significance. The large magnitude of these estimates from HTM compared to those from other estimation methods in Table 6 perhaps reflects their endogenous treatment in the HTM.

The presence of a common language, English, has a positive impact on bilateral services exports, but the result is statistically insignificant[26].

As expected, the coefficient on the distance variable showed up with a negative sign and was statistically significant with an elasticity of -0.68. This result is in contrast to Walsh (2006)[27]. Our results imply that a 10% increase in the distance between the economic centres of any two trading partners is likely to bring down bilateral services exports by 6.8%, *ceteris paribus and*

[26] Once again, this may be the result of the HTM estimation as all other methods in Table 6 report a statistically significant estimate of the common language variable. Only Kimura & Lee (2004) report a similar insignificant impact.

[27] "Although distance between the importer and exporter is typically expected to have a negative impact on trade in goods, it is not clear from the review of the existing literature that this is necessarily the case for services. Service products do not have to be physically transported from location to location. Depending on the nature of the service, in some cases it will require movement of physical persons, but in others it may be communicated electronically. Consequently, the importance of distance in services trade may be low or even insignificant." Walsh (2006), op.cit., pp 11-12.

on average. Interestingly, in our specification, unlike Kimura & Lee's result (2004), distance turns out to be a more important determinant of goods trade as an analogous regression with goods import shows the coefficient to be a negative 0.98. Our result, however, conforms more to services trade theory as certain services do not require the physical proximity of the supplier and the consumer for the service to be delivered and distance would therefore not be an important factor for such services. This would be true, for instance, for services delivered through Mode 1, which according to Karsenty (2000) comprise 41% of international trade in services.

Finally, the PTA_SVS dummy had a positive and significant coefficient of 0.11, which translates into a trade effect of 11.6[28]%, *ceteris paribus and on average*.

To recapitulate, the results from our multivariate analysis validate the choice of determinants in our empirical model (except for the common law variable). As discussed in the appendix, we also come up with a hitherto unexplored methodology to estimate the impact of bilateral goods exports on bilateral services exports. Our results also report much lower elasticities of the GDP variables compared to those in the literature, which stems from using an estimation methodology which accounts for heterogeneity and also endogenizes the impact of preferentialism. The human capital, teledensity and restrictiveness variables used in our model indicate the direct policy options available to governments to promote bilateral services trade and their economic, if not always, statistical significance in our results underlines why they ought to be doing so. Finally, in contrast to other empirical results in this literature, we find distance to be both significant and less important for services trade than for goods trade, a result which conforms both to services trade theory (Mode 1) and to the economic fact that 41% of all trade in services is Mode 1.

[28] Calculated as [exp(0.11)-1]*100

8. Disaggregating the impact of preferential trade agreements

In what follows, we use the HTM to study the impact of PTAs in detail breaking these down by the economic status of the trading partners and by the reciprocity (or the lack thereof) of commitments. The trade effect by type of PTA in each case is shown in Table 7. The empirical estimates of the other variables in the estimation have not been shown in this table as our focus is on detailing the impact of PTAs as opposed to discussing the entire estimation output.

<Insert Table 7 here>

Looking at services agreements **(Column I-II, Table 7)**, we found the trade effect of NN_PTA_SVS to be both statistically and economically significant (10.7% increase in bilateral services exports) while that of NS_PTA_SVS to be statistically insignificant (but with a trade effect of 16.8%). SS_PTA_SVS dropped out of the estimation. We found the result for NS_PTA_SVS to be driven by asymmetric agreements (statistically insignificant but with a trade effect of 16.5%). The trade effect of symmetric NS_PTA_SVS agreements, on the other hand, after controlling for the impact of services agreements between the EU and former CEEC, was both statistically and practically insignificant.

Replicating the analysis for "any agreement" **(Column III-IV, Table 7)**, we found the trade effect of NN_PTA_ANY to be both economically and statistically significant as well (11.3% increase in bilateral services exports) while that of NS_PTA_ANY to be statistically insignificant (but with a trade effect of 5.7%). SS_PTA_ANY dropped out of the estimation. *A la* services accords, the result for NS_PTA_ANY was largely due to asymmetric agreements (statistically insignificant but with a trade effect of 13.6%).

Finally, looking at "goods only" agreements **(Column V-VI, Table 7)**, we found the results for NN_GOPTA and NS_GOPTA to lack statistical significance (but with a trade effect of 5.6% in the former). SS_GOPTA again dropped out of the estimation[29].

[29] There are no South-South agreements in our sample of countries over 1999-2003 which is why the associated PTAs drop out of all these estimations.

Table 8 summarizes these results.

<Insert Table 8 here>

Thus, only North-North agreements (services or any) report both a positive and statistically significant trade effect between partners, which points to the predominance of increasing returns to scale (IRS) and intra-industry services trade in our sample. Empirically, this emanates from the fact that our data is dominated[30] by North-North accords and there are comparatively fewer observations in our sample on North-South agreements and none at all on South-South accords, which therefore drop out of the estimation.

The lack of statistical significance in the other results suggests that these should be interpreted with caution. However, as Schafer (1993) points out "the event of nonsignificance suggests only that the data are not sufficient to estimate a parameter. This does not mean the data estimate the parameter to be zero![31]" In further defence, our point estimates are not small in magnitude and there is no *a priori* reason for assuming the trade effect to be zero; therefore in the absence of a Bayesian prior, the estimated coefficient is thus perhaps our best measure of the trade effect.

Schafer (1993) also recommends that "nonsignificant results be accompanied by an evaluation of statistical power[32]"wherein his decision rule rules out results with too low or too high a statistical power[33]. Our evaluation of statistical power revealed that only three of the ten estimates that reported statistical nonsignificance in Table 8 had a statistical power[34] that was neither too low, nor too high and these have been highlighted in red in that table[35].

[30] 21% of all observations in our sample are N-N, while only 6% are N-S and there are no observations on S-S accords during the period covering our analysis.
[31] Schafer (1993), op. cit. pp 384-385.
[32] Schafer (1993), op. cit. pp 386-387.
[33] "Should it turn out that the power of the study was low against even a reasonably large effect size, then we are forced to the conclusion that nothing much has been learned. On the other hand, when the power is large, then we can infer that if an effect exists it seems too small to be of much value." Schafer (1993), op. cit. pp 386.
[34] This ranged from 0.37 to 0.58 at the 5 and 10% levels of significance.
[35] The statistical power was less than 0.2 in all other cases.

These are the results that we focus on while comparing the magnitudes of the different trade effects and find that in aggregate, North-South services agreements have the largest *positive* trade effect. This finding, together with the result on North-North agreements, suggests that services trade between countries in our sample may be driven as much by differences in factor endowments as by IRS and in that, such trade may be both inter- and intra-industry. Further, within North-South agreements and irrespective of the form the agreement takes, asymmetric accords always have the larger trade effect and this is always positive. These findings thus suggest greater alliance between the North and the South in a bid to boost bilateral services trade and more importantly, suggest that this relationship can be less than perfectly reciprocal to be net trade-creating. Such agreements could thus attempt to capitalize on cost differences between trading partners based on differences in factor endowments and regulatory requirements and generate more inter-industry trade. Finally, while "goods only" agreements have the smallest trade effect on bilateral services exports, the fact that they do have a positive (albeit statistically insignificant) effect confirms complementarities between provisions in such agreements and bilateral services trade. This is what we discuss next.

Table 9 summarises the trade effects from multivariate analyses conducted to study the sequential impacts of services and "goods only" agreements for both intra-EU and all other trading partners in our sample using HTM. As this table shows, services accords by themselves report a positive and statistically significant trade effect (except for intra-EU trading partners in our sample). "Goods only" agreements do not report a statistically significant[36] (services) trade effect in our sample of countries[37]; indeed they only report a huge positive (services) trade effect for the intra-EU trading partners in our sample. However, when such accords are paired with services agreements in non-EU countries or in the entire sample, the (services) trade effect of each set of agreements is enhanced, thereby confirming complementarities between the two. The magnitude of the (services) trade effect ranges from 12.1 to 13.4% for services agreements and 2.3 to 2.4% for the "goods only" accords, *ceteris paribus and on average.* This also

[36] None of the results in Table 9 that show statistical nonsignificance passed Schafer's (1993) decision rule in an evaluation of statistical power. They should thus be interpreted with caution.
[37] Once again, this may be the result of the sample size as "goods only" accords comprise only 5% of all observations in our sample.

suggests that trading partners would benefit more from negotiating goods and services agreements in tandem, as opposed to sequentially.

<Insert Table 9 here>

9. Conclusion

The empirical literature on gravity model estimation of bilateral services trade exhibits neither consensus nor conformity to economic theory in estimating the impact of the determinants of such trade. The role of bilateral goods trade in determining bilateral services trade has not been explored in detail as well; neither has the separate impact of "goods only" and services accords on bilateral services trade ever been studied. Methodologically, only recent empirical work accounts for the influence of heterogeneity in trading country pairs in determining bilateral services trade, but even this fails to recognize the endogeneity of agreements in model estimation.

This paper is an improvement on all these fronts. Our analysis explicitly accounts for the existence of alternative modes of supply and their relationships, which is needed not just for better understanding of the determinants and pattern of services trade, but also the effects of policies as can be seen from the results of our analyses.

A caveat in the analysis undertaken here is the homogeneity of the PTA dummies, the calibration of which does not take into account the varying extents of liberalization in different agreements. This could therefore be an agenda for further research in this area. The paper also does not look into the political economy of bilateral services trade as well as issues of regulatory harmonization, both of which can be candidates for further research and analysis.

Bibliography

Anderson, James E. (1979). 'A Theoretical Foundation for the Gravity Equation,' *American Economic Review*, 69(1), pp.106-116.

Anderson, J. and E.van Wincoop (2003). 'Gravity with Gravitas: A Solution to the Border Puzzle,' *American Economic Review*, Vol. 93(1), pp. 170-192.

Baier, Scott L. & Jeffrey H. Bergstrand (2002). "On the endogeneity of international trade flows and free trade agreements," Manuscript, August 2002, http://www.nd.edu/~jbergstr/Working_Papers/EndogeneityAug2002.pdf.

Baier, Scott L. & Jeffrey H. Bergstrand (2004). 'Economic determinants of free trade agreements,' *Journal of International Economics* 64 (1), 29–63 (October).

Baier, S.L. & Jeffrey H. Bergstrand (2007). 'Do free trade agreements actually increase members' international trade?' *Journal of International Economics* 71 (2007), 72–95.

Baldwin, Richard & James Harrigan (2008). 'Zeroes, Quality and Space: Trade Theory and Trade Evidence,' NBER, Working Paper 13214, March.

Carrere, Celine (2006). 'Revisiting the effects of preferential trade agreements on trade flows with proper specification of the gravity model,' *European Economic Review* 50 (2006) 223–247.

Cheng, I.-H. and H. Wall (2005). 'Controlling for Heterogeneity in Gravity Models of Trade and Integration,' Federal Reserve Bank of St. Louis Review, Vol. 87(1), pp. 49-63.

Dee, Philippa (2005). 'A compendium of barriers to trade in services,' Australian National University, Canberra.

Egger, P., (2002). 'An econometric view on the estimation of gravity models and the calculation of trade potentials,' *The World Economy* 25, 297–312.

Egger, P., (2005). 'Alternative techniques for estimation of cross-section gravity models,' *Review of International Economics*, 13(5), 881-891.

Egger, H., Egger, P. & David Greenaway (2008). 'The trade structure effects of endogenous preferential trade agreements,' *Journal of International Economics* 74 (2008), 278–98.

Evenett, Simon J. (2002). 'The Impact of Economic Sanctions on South African Exports,' Scotish Journal of Political Economy, Vol.49, No.5, November.

Feenstra, R. 2004. *Advanced International Trade: Theory and Evidence*, Oxford: Princeton University Press.

Feenstra, Markusen and Rose (2001). 'Using the gravity equation to differentiate among alternative theories of trade,' *Canadian journal of economics* 34 (2).

Frankel, J.A. (1997). *Preferential Trading Blocs*, Institute for International Economics, Washington, DC.

Gasiorek, Michael, Peter Holmes, Sherman Robinson, Jim Rollo & Anirudh Shingal (2007). 'Qualitative Analysis of a Potential Free Trade Agreement between the European Union and India,' the European Commission and CARIS, Department of Economics, University of Sussex, UK, February
http://trade.ec.europa.eu/doclib/docs/2007/june/tradoc_135101.pdf

Grünfeld, Leo A. and Andres Moxnes (2003). 'The Intangible Globalization: Explaining the Patterns of International Trade in Services,' Discussion Paper No.657, Norwegian Institute of International Affairs.

Hausman, A. & E. Taylor (1981). 'Panel data and unobservable individual effects,' *Econometrica* 49, 1377–1398.

Helpman, Elhanan, Marc Melitz and Yona Rubinstein (2008). 'Estimating Trade Flows: Trading Partners and Trading Volumes,' *Quarterly Journal of Economics*, 123(2), 441-487.

Karsenty, G. (2000). 'Assessing Trade in Services by Mode of Supply,' *GATS 20-00: New Directions in Services Trade Liberalisation*, Brookings Institution, Washington DC, pp.33-56.

Kimura, Fukunari (2003), 'Economic Analysis on Japan-Korea FTA: Services Trade,' manuscript, Keio University.

Kimura, F. & H. Lee (2004). 'The Gravity Equation in International Trade in Services,' European Trade Study Group Conference, University of Nottingham, September 9-11.

Kimura, F. & H. Lee (2006). 'How does economic freedom affect international trade in services?' May

Kox, H. and A. Lejour (2005). 'Regulatory Heterogeneity as Obstacle for International Services Trade,' CPB Discussion Paper, No. 49.

Lejour, A.& J.de P. Verheijden (2004). 'Services trade with Canada and the European Union,' CPB Discussion Paper No.42, CPB Netherlands Bureau for Economic Policy Analysis.

Lennon, C. 2006. 'Trade in Services and Trade in Goods: Differences and Complementarities,' Paper presented at the 8th Annual Conference of the European Trade Study Group, 7th-9th September, 2006, Vienna.

Magee, Chris (2003). 'Endogenous preferential trade agreements: An empirical analysis,' Contributions to Economic Analysis and Policy, vol. 2, no. 1. Berkeley Electronic Press.

Mirza, Daniel and Giuseppe Nicoletti (2004). 'What is so Special about Trade in Services?' Research Paper 2004/02, Leverhulme Centre for Research on Globalisation and Economic Policy.

OECD (2002), 'OECD Statistics on International Trade in Services, Detailed Tables by Partner Country 1999-2002.'

Santos Silva, J. M. C. and S. Tenreyro (2006). 'The log of gravity,' *The Review of Economics and Statistics* 88 (4), pp 641- 658.

Schafer, William D. (1993). 'Interpreting statistical significance and nonsignificance,' *Journal of Experimental Education* 61:4, pp 383-387.

Schumacher, D. and B. Siliverstovs (2007). 'Estimating gravity equations: To log or not to log?,' Discussion Paper 739, German Institute for Economic Research, DIW Berlin, October.

Shepherd, Ben (2008). 'Notes on the "Theoretical" Gravity Model of International Trade.'

Soloaga, I. and L. A. Winters (2001) 'Preferentialism in the nineties: What Effect on Trade?' *The North American Journal of Economics and Finance*, 12.

Walsh, Keith (2006). 'Trade in Services: Does Gravity Hold? A Gravity Model Approach to Estimating Barriers to Services Trade,' IIIS Discussion Paper, No. 183, October 2006.

Figure 1: Top services export flows (real USD bn, 1999-2003)

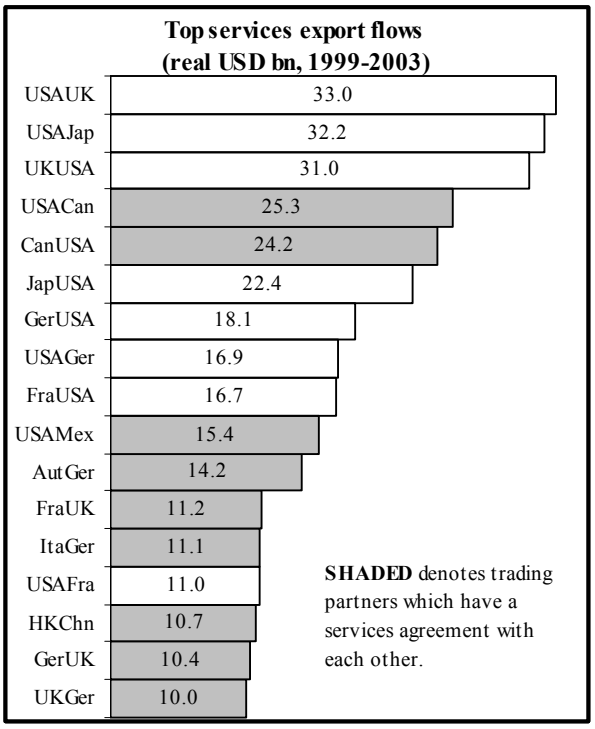

Table 1: Determinants of services trade by sector and mode of delivery

Sector	Mode of Delivery	Determinants of Trade
Computer & related services	1,3,4	Infrastructure, human capital, English language, open policy regime
Telecom	3	Market, infrastructure, open policy regime
Insurance	1,3	Infrastructure, English language, open policy regime, market size
Banking	1,3	Infrastructure, English language, open policy regime, market size
Construction	3,4	Infrastructure, open policy regime, trade in goods
Distribution	3	Market size, open policy regime, trade in goods
Health	1,2,3,4	Infrastructure, human capital, open policy regime
Architectural services	1,3,4	Infrastructure, human capital, open policy regime
Legal services	1,3,4	Infrastructure, human capital, open policy regime, common legal system
Accountancy services	1,3,4	Infrastructure, human capital, open policy regime, common laws
Hotels, restaurant and tourism services	2,3	Market size, cultural ties/hospitality, English language, infrastructure,
Transport services	3	Market size, infrastructure, open policy regime, trade in goods

Table 2: List of variables, their description and data source

Variable Name	Description	Data Source
$SVSX_{ijt}$	Services exports from country i (reporter) to country j (partner)	OECD bilateral trade in services database
GDP_{kt}	GDP of country k (k = i,j)	World Bank's World Development Indicators (WDI)
$PCGDP_{kt}$	Per capita income of country k (k = i,j)	World Bank's WDI
$DIST_{ij}$	Geographical distance between the two countries' economic centres (capital cities for simplicity)	Vulcansoft **(http://www.vulconsoft.com/html97)** Indocom **(http://www.indocom.com/distance)**
$GDSX_{ijt}$	Goods exports from country i (reporter) to country j (partner)	IMF's Direction of Trade Statistics
ENG_{ij}	A dummy variable that takes the value 1 if English is the official language in the trading partners	CIA's Factbook about languages in the countries of the world
$REST_k$	Extent of restrictiveness to services trade in country k (k = i,j) measured by trade restrictiveness indices	Developed by Australian Productivity Commission; compiled by Dee (2005). Annex Table A2 shows the countries, sectors and years for which this information is available. $REST_k$ is an unweighted average of the restrictiveness indices for each of these services sub-sectors.
$TELEDEN_{kt}$	Index of telecom density measured by fixed line and mobile phone subscribers (per 1000 people) [proxy for infrastructure development in country k (k = i,j)]	World Bank WDI
HK_{kt}	Measure of human capital in country k (k = i,j) proxied by gross tertiary school enrolment[38] (%)	World Bank WDI
LAW_{ij}	A dummy variable that takes the value 1 if the trading partners have a common legal system	CIA's Factbook about legal systems in the countries of the world
PTA_SVS_{ijt}	A dummy variable that takes the value 1 if the trading partners are a member of the same services accord	WTO's Committee on Regional Trade Agreements

[38] Even though enrolment is an investment variable as opposed to a stock variable, it is still a stock measure (even if imperfect) of the flow in steady state.

Table 3: Description of data for variables used in the model

Variable	Obs	Mean	Std. Dev.	Min	Max
svsx (real USD bn)	4327	1.0	3.1	0.0	38.0
gdsx (real USD bn)	6363	3.1	11.6	0.0	250.0
gdpi (real USD bn)	6603	1040.0	2130.0	19.5	11700.0
gdpj (real USD bn)	6603	604.0	1530.0	7.8	11700.0
popi (mn)	6603	37.0	59.0	0.4	291.0
popj (mn)	6603	90.5	219.0	0.3	1290.0
pcgdpi (USD, cur intl PPP)	5544	26397.8	9218.4	10800.0	65349.0
pcgdpj (USD, cur intl PPP)	6603	16805.2	10384.9	795.0	37501.0
hki	6180	55.2	17.2	9.0	87.0
hkj	5781	44.7	20.0	3.0	87.0
teledeni	6603	1194.2	262.5	430.0	1998.0
teledenj	6603	796.8	491.3	4.0	1750.0
engij (dummy for common language)	6603	0.1	0.3	0.0	1.0
lawij (dummy for common legal system)	6603	0.3	0.5	0.0	1.0
resti	6603	0.2	0.1	0.1	0.5
restj	6228	0.3	0.2	0.1	0.7
distij	6478	6196.3	4755.8	66.0	19845.0
Documents for import (year 2005)	6603	8.2	3.4	3.0	16.0
Time for import (year 2005)	6603	22.0	12.3	3.0	53.0
Cost of import (year 2005)	6603	999.7	448.0	333.0	2260.0
Simple avg. appd. Tariff	6353	8.6	1.3	2.0	9.6
Import-wted. appd. Tariff	6353	7.8	1.1	2.4	8.6
Simple avg. MFN tariff	6353	10.4	1.2	5.3	11.9
Import-wted. MFN tariff	6353	9.6	1.0	4.6	10.5
PTA_GDS (dummy for goods PTAs)	6603	0.28	0.45	0.00	1.00
PTA_SVS (dummy for services PTAs)	6603	0.22	0.42	0.00	1.00
PTA_ANY (dummy for any PTA)	6603	0.28	0.45	0.00	1.00
GOPTA (dummy for "goods only" PTAs)	6603	0.05	0.23	0.00	1.00
nngopta	6603	0.01	0.11	0.00	1.00
ssgopta	6603	0.00	0.00	0.00	0.00
nsgopta	6603	0.04	0.20	0.00	1.00
asymnsgopta	6603	0.00	0.07	0.00	1.00
symnsgopta	6603	0.04	0.19	0.00	1.00
euceecgopta	6603	0.02	0.13	0.00	1.00
nn_pta_svs	6603	0.20	0.40	0.00	1.00
ss_pta_svs	6603	0.00	0.00	0.00	0.00
ns_pta_svs	6603	0.02	0.15	0.00	1.00
asymns_pta_svs	6603	0.01	0.10	0.00	1.00
symns_pta_svs	6603	0.01	0.11	0.00	1.00
euceec_pta_svs	6603	0.01	0.11	0.00	1.00
nn_pta_any	6603	0.21	0.41	0.00	1.00
ss_pta_any	6603	0.00	0.00	0.00	0.00
ns_pta_any	6603	0.06	0.24	0.00	1.00
asymns_pta_any	6603	0.01	0.12	0.00	1.00
symns_pta_any	6603	0.05	0.22	0.00	1.00
euceec_pta_any	6603	0.03	0.16	0.00	1.00

Table 4: Averages by groups - Top services exporters and PTAs

Percentiles	SvsX (real USD mn)	GdsX (real USD bn)	GDPi (real USD bn)	GDPj (real USD bn)	PCGDPi	PCGDPj	POPi (mn)	POPj (mn)	HKi	HKj	TELEDENi	TELEDENj	RESTi	RESTj	DISTij (km)
P10	4.4	0.0	60.9	47.2	16'303.8	4'074.0	4.5	4.5	30.3	15.0	984.0	192.6	0.1	0.2	892
P20	15.0	0.1	123.0	74.0	18'544.8	6'412.2	5.4	6.7	48.8	23.4	1'083.8	273.8	0.2	0.2	1'329
P30	41.7	0.2	136.0	105.0	26'034.4	8'929.4	8.1	10.2	50.6	30.3	1'102.2	360.8	0.2	0.2	2'019
P40	70.6	0.3	186.0	129.0	26'239.2	10'827.2	10.2	15.6	52.8	36.6	1'138.6	567.0	0.2	0.2	3'209
P50	130.0	0.5	257.0	179.0	26'549.8	17'329.0	10.3	31.1	58.2	48.8	1'182.8	985.4	0.2	0.2	5'702
P60	230.0	0.8	430.0	216.0	26'670.6	23'018.4	19.4	44.6	59.5	52.8	1'239.6	1'102.2	0.2	0.3	7'660
P70	397.0	1.4	693.0	317.0	27'816.4	26'157.8	40.9	62.0	60.6	54.8	1'281.2	1'160.2	0.2	0.3	8'833
P80	719.0	2.6	1'510.0	533.0	29'208.2	26'670.6	59.3	82.3	72.0	60.1	1'392.2	1'250.2	0.2	0.4	9'839
P90	2'300.0	6.0	2'130.0	1'370.0	29'563.6	29'393.2	82.3	146.0	75.2	70.8	1'445.0	1'392.2	0.4	0.5	12'110
P90/P10	**525.9**	**222.8**	**35.0**	**29.0**	**1.8**	**7.2**	**18.2**	**32.3**	**2.5**	**4.7**	**1.5**	**7.2**	**3.1**	**3.5**	**13.6**

Agreements	SvsX (real USD mn)	GdsX (real USD bn)	GDPi (real USD bn)	GDPj (real USD bn)	PCGDPi	PCGDPj	POPi (mn)	POPj (mn)	HKi	HKj	TELEDENi	TELEDENj	RESTi	RESTj	DISTij (km)
PTA_SVS=0	766.8	2.0	1152.0	616.1	25913.5	14607.9	40.3	109.0	54.9	41.1	1168.4	683.2	0.2	0.3	7491.7
PTA_SVS=1	1727.0	7.3	631.1	560.5	28475.5	24450.8	25.2	26.1	56.4	56.3	1284.2	1192.0	0.2	0.2	1759.6
(1/0)	**2.3**	**3.7**	**0.5**	**0.9**	**1.1**	**1.7**	**0.6**	**0.2**	**1.0**	**1.4**	**1.1**	**1.7**	**0.8**	**0.8**	**0.2**
PTA_ANY=0	768.7	2.0	1185.0	649.4	25664.2	14448.7	41.3	115.0	54.6	41.7	1157.2	666.1	0.2	0.3	7752.5
PTA_ANY=1	1522.0	6.1	649.2	485.0	28616.0	22918.9	25.7	27.0	56.6	51.7	1290.4	1136.0	0.2	0.2	2234.6
(1/0)	**2.0**	**3.1**	**0.5**	**0.7**	**1.1**	**1.6**	**0.6**	**0.2**	**1.0**	**1.2**	**1.1**	**1.7**	**0.8**	**0.8**	**0.3**

Table 5: Correlation between variables (panel 1999-2003)

(n = 3123)	lsvsx	lgdsx	lgdpi	lgdpj	lpcgdpi	lpcgdpj	lteledeni	lteledenj	lhki	lhkj	engij	lawij	lresti	lrestj	pta_svs	pta_gds	ldist
lsvsx	1.00																
lgdsx	**0.85**	1.00															
lgdpi	**0.55**	**0.58**	1.00														
lgdpj	**0.49**	**0.47**	0.03	1.00													
lpcgdpi	0.30	0.18	0.28	-0.01	1.00												
lpcgdpj	0.36	0.28	-0.06	0.25	-0.03	1.00											
lteledeni	0.11	0.03	0.06	-0.03	**0.68**	-0.04	1.00										
lteledenj	0.26	0.22	-0.09	0.10	-0.02	**0.91**	0.04	1.00									
lhki	0.22	0.29	**0.47**	0.03	-0.02	0.01	0.07	0.00	1.00								
lhkj	0.20	0.14	-0.07	0.07	-0.03	**0.76**	0.00	**0.77**	-0.01	1.00							
engij	0.17	0.09	0.12	-0.02	0.13	-0.01	0.04	-0.06	0.07	0.00	1.00						
lawij	0.17	0.21	-0.03	0.07	0.00	0.18	-0.02	0.20	-0.05	0.06	0.14	1.00					
lresti	-0.22	-0.18	-0.28	0.03	**-0.66**	0.04	**-0.58**	0.05	-0.32	0.04	-0.19	0.00	1.00				
lrestj	-0.21	-0.12	0.00	-0.18	0.01	**-0.46**	0.05	-0.36	-0.01	**-0.46**	-0.06	-0.03	-0.03	1.00			
pta_svs	0.21	0.20	0.00	-0.09	0.15	0.35	0.19	0.37	0.11	0.31	-0.12	0.20	-0.14	-0.17	1.00		
pta_gds	0.22	0.20	0.01	-0.13	0.17	0.32	0.22	0.38	0.14	0.21	-0.12	0.23	-0.18	-0.14	**0.83**	1.00	
ldist	-0.19	-0.27	0.18	0.21	0.11	-0.25	0.05	-0.32	0.06	-0.23	0.19	-0.28	-0.10	-0.06	**-0.51**	**-0.51**	1.00

Table 6: Results from multivariate analysis

	Dependent variable: Bilateral services exports								
Variables/Estimation	**OLS**	**OLS**	**PPML**	**PPML**	**HTM**	**FEM**	**FEM**	**B&B(2007)**	**DID**
GDSXij	0.4***	0.396***	0.43***	0.43***	**0.17*** **	0.098***	0.067*	0.19***	
GDPi	0.67***	0.7***	0.8***	0.8***	**0.58*** **	0.56***	0.7***	0.3	
GDPj	0.54**	0.5*	0.84***	0.85***	**0.49*** **	0.73*	1.4***	0.55***	
HKi	0.34***	0.31***	-0.12	-0.06	**0.84*** **	0.32***	0.26***	-0.63	
HKj	0.33	0.37#	-0.23**	-0.26***	**0.089**	0.13	-0.45	-0.76*	
TELEDENi	0.8***	1.6***	0.6***	1.5***	**0.17**	0.44***	0.7***	0.23	
TELEDENj	0.26***	0.3***	0.3***	0.37***	**0.38*** **	0.03	0.11#	-0.14	
DPCGDPij	----------very small----------								
ENGij	1.3***	1.3***	0.6***	0.64***	**0.87**				
RESTi	-0.5***	-0.2*	-0.58***	-0.37***	**-1.7**				
RESTj	-0.37***	-0.36***	-0.56***	-0.55***	**-1.4**				
SVS_PTAij	0.126*	0.11*	-0.44***	-0.45***	**0.11***	-0.017	-0.022	0.055	0.028
DISTij	-0.76***	-0.76***	-0.64***	-0.64***	**-0.68****				
Year2000		-0.26***		-0.26***	**-0.003**		-0.009		
Year2001		-0.4***		-0.36***	**-0.094**		-0.094#		
Year2002		-0.5***		-0.4***	**-0.16*** **		-0.17**		
Year2003		-0.7***		-0.5***	**-0.18****		-0.3***		
Constant	-16.2**	-21.5***	-25.6***	-32.5***	**-16.4*** **	-18.8*	-42.4***	-192.4	101.2
Observations	3123	3123	3296	3296	**3123**	3262	3262	3262	3069
R-squared	0.8	0.8	0.9	0.9	*Within*	0.3	0.3	0.5	0.19
					Between	0.56	0.58	0.00	
					Overall	0.56	0.58	0.01	

Note: "OLS" is Ordinary Least Squares; "PPML" is Poisson Pseudo-Maximum Likelihood; "HTM" is Hausman-Taylor Method; "B&B" is Baier & Bergstrand (2007). Estimations based on PPML, B&B & HTM used log levels of HKi and HKj as independent variables; the other methods used their respective residuals from separate regressions on the log levels of GDPi and GDPj to account for multicollinearity.

Levels of significance: #10%; *5%; **1%; ***0.1%

Table 7: Trade effect by type of PTA

Type of PTA/Trade effect (%)	**I**	**II**	**III**	**IV**	**V**	**VI**
NN_PTA_SVS	10.7*	10.2#				
NS_PTA_SVS	16.8					
ASYM_NS_PTA_SVS		16.5				
SYM_NS_PTA_SVS		-100				
EUCEEC_PTA_SVS		-100				
NN_PTA_ANY			11.3*	11		
NS_PTA_ ANY			5.7*			
ASYM_NS_PTA_ ANY				13.6		
SYM_NS_PTA_ ANY				-4.5		
EUCEEC_PTA_ ANY				-100		
NN_GOPTA					5.6	6.3
NS_GOPTA					-2.3	
ASYM_NS_GOPTA						0.14
SYM_NS_GOPTA						-5.6
EUCEEC_GOPTA						-100

Significance levels: #10%; *5%

Table 8: Summarizing impact of PTAs on bilateral services exports

Code	Type of agreement	Any PTA	PTA_SVS	"Goods Only" PTA
I	**North-North**	11.3%*	10.5%*	5.5% *(Insignificant)*
II	**South-South**	Dropped	Dropped	Dropped
III	**North-South**	5.7% *(Insignificant)*	**16.8%** ***(Insignificant)***	-2.3% *(Insignificant)*
III. A	**Asymmetric North-South**	**13.9%** ***(Insignificant)***	**16.5%** ***(Insignificant)***	0.1% *(Insignificant)*
III. B	**Symmetric North-South**	-4.5% *(Insignificant)*	-100% *(Insignificant)*	-5.5% *(Insignificant)*

Note: * indicates 5% level of significance

Table 9: Sequential and incremental impact of PTAs on bilateral services exports

	PTA_SVS		"Goods only" PTA		
Serial no.	**Trade effect**	**Statistical significance**	**Trade effect**	**Statistical significance**	**Sample coverage**
1	11.6%	Yes*			All
2			-1.6%	No	All
3	12.1%	Yes*	2.4%	No	All
4	-100%	No			Intra-EU
5			Huge	No	Intra-EU
6	-100%	No	-50.3%	No	Intra-EU
7	12.7%	Yes*			Non-EU
8			-2.2%	No	Non-EU
9	13.4%	Yes*	2.3%	No	Non-EU

Note: * indicates 5% level of significance

Appendix

Treatment of bilateral goods trade as an explanatory variable

The inclusion of bilateral goods export ($GDSX_{ijt}$) in our estimation suffers from the obvious problem of endogeneity as there are several common factors that have an impact on both goods and services trade such as GDP for instance and hence, it is not easy to distinguish the impact of goods trade (on services trade) from that of these other factors.

We thought of four different ways of tackling these problems:
(1) Treat bilateral services and bilateral goods trade as a system of simultaneous equations where the bilateral trade variable in each case is the endogenous variable and the exogenous variables in the system are the other explanatory variables common to both as discussed above[39].

[39] The only difference was to use applied weighted tariffs instead of RESTj in the determination of bilateral goods trade and replace PTA_SVS with PTA_GDS as the PTA dummy.

(2) Use instrumental variable (IV) estimation where instrumental variables such as tariffs, costs of importing, etc. could be used to instrument for bilateral goods trade in our model for bilateral services trade.
(3) Estimate bilateral goods trade using the explanatory variables in our model that are common determinants for services trade as well and to use the residual obtained from this as an additional explanatory variable in our bilateral services trade model in lieu of gdsx as this residual would be stripped off the effect of all the common factors.
(4) Use the predicted value of goods trade in (3) or its lagged values as an explanatory variable in our model for bilateral services trade.

We tried out these alternatives in turn with the following results:

(1) Our simultaneous equation system predicted both bilateral goods and bilateral services trade very well (R-squared of 99% in each case). The estimation however inflated the coefficient on GDSX and deflated those on GDP_k in predicting bilateral services trade. The latter were in fact returned with negative and significant signs! The results remained equally unsound if the model was run separately for intra-EU and all other trading partners in our sample. Given that 75% of global trade is merchandise trade, the estimation of goods trade thus seems to swamp that of services trade in a simultaneous equation system, which therefore seems to account for such a result.

(2) For our IV model, we used time taken to import goods as an instrument for bilateral goods trade. We also tried other instruments like tariffs and costs of an import container but found these to be less correlated with bilateral goods trade than time taken to import[40]. In this IV estimation, bilateral goods trade had an elasticity of 2.7 but was insignificant. GDP_k also had insignificant but large negative elasticities[41]. These results are possibly on account of our choice of the instrument, which may be not as independent of our dependent variable as one would want. At least, 25% of all bilateral services trade flows are transportation services and import time would therefore be negatively related with these[42][43].

(4) The predicted value of goods trade from the bilateral goods trade estimation had a coefficient of -0.276 as an explanatory variable for bilateral services trade. Lagged values of goods trade, even as far back as 10 years, were strongly correlated with current values of bilateral services trade. Thus, using them as an explanatory variable would lead to the same endogeneity problems that we were trying to account for in the first place.

(3) But the residual from the bilateral goods trade estimation had a coefficient of 0.4 and was also significant at 1%, which suggests that the marginal impact of bilateral goods exports on bilateral services exports is 40%, *ceteris paribus and on average*. This residual is what we thus used in our final empirical estimations.

[40] Even this had a low statistical correlation of -0.257 with bilateral goods trade.
[41] For intra-EU trading partners in our sample, the coefficient on goods export remained negative and insignificant. For the other remaining trading partners, the coefficient on goods export remained insignificant but became positive (0.46).
[42] Data in fact confirmed this. The correlation coefficient between time taken to import and bilateral services exports was -0.2276.
[43] Lennon (2006), however, used tariffs as an instrument for goods trade and got results in the right direction, but she included only "other commercial services" (OCS) in her analysis.

Table A1: List of exporters and importers

Exporters: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, Ireland, Italy, Japan, Republic of Korea, Luxembourg, the Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, the United Kingdom and USA.

Importers: Argentina, Australia, Austria, Benelux, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Islamic Republic of Iran, Ireland, Israel, Italy, Japan, Republic of Korea, Malaysia, Mexico, the Netherlands, New Zealand, Nigeria, Norway, Pakistan, the Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, Slovak Republic, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, Ukraine, USA and Venezuela.

Table A2: Snapshot of services restrictiveness indices across countries and sub-sectors

COUNTRY	AIR TRANSPORT	BANKING	DISTRIBUTION	ELECTRICITY GENERATION	MARITIME	PROFESSIONAL	TELECOM
Argentina	1995	1997	1999	1999	2001	1999 (AArE)	1997
Australia	1995	1997, 2005	1999, 2005	1999	2001	1999 (AArEL)	1997, 2005
Austria	1995	1997	1999	1999	n.a.	1999 (AArEL)	1997
Belgium	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Brazil	1995	1997, 2004	1999, 2004	1999	2001	1999 (AArE)	1997, 2004
Canada	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Chile	1995	1997, 2004	1999	1999	2001	1999 (AArE)	1997, 2004
Hong Kong	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Colombia	1995	1997	1999	1999	2001	1999 (A)	1997
Denmark	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Finland	1995	1997	1999	1999	2001	1999 (AArEL)	1997
France	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Germany	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Greece	1995	1997	1999	1999	2001	1999 (AArEL)	1997
India	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Indonesia	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Ireland	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Italy	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Japan	1995	1997, 2005	1997, 2005	1999	2001	1999 (AArEL)	1997, 2005
Korea	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Luxemburg	1995	1997	1999	1999	n.a.	1999 (AArEL)	1997
Malaysia	1995	1997, 2003	1999	1999	2001	1999 (AArEL)	1997, 2002
Mexico	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Netherlands	1995	1997	1999	1999	2001	1999 (AArEL)	1997
New Zealand	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Peru	1995	1997	1999	1999	2001	1999 (A)	1997
Philippines	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Portugal	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Russia	1995	2004	2004	1999	2001	2004 (E)	1997
Singapore	1995	1997	1999	1999	2001	1999 (AArEL)	1997
South Africa	1995	1997	1999	1999	2001	1999 (AArE)	1997
Spain	1995	1997	1999	1999	n.a.	1999 (AArEL)	1997
Sweden	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Switzerland	1995	1997	1999	1999	n.a.	1999 (AArEL)	1997
Thailand	1995	1997, 2004	1999, 2002	1999, 2002	2001	1999 (AArEL)	1997, 2004
Turkey	1995	1997	1999	1999	2001	1999 (AArEL)	1997
USA	1995	1997	1999	1999	2001	1999 (AArEL)	1997
UK	1995	1997	1999	1999	2001	1999 (AArEL)	1997
Vietnam	1995	2004	2004	1999, 2004	2001	2004 (AArEL)	1997, 2004

Source: Dee (2005)
Note: A = Accountancy; Ar = Architectural; E = Engineering; and L = Legal Services